NEXTCHEM

UNFOLD
STAMICARBON
15TH SYMPOSIUM 2026

CO_2 RECOVERY FROM FLUE GAS

Prayagraj Dhruv
Veronica Rivas

AGENDA

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MAIN IDEA

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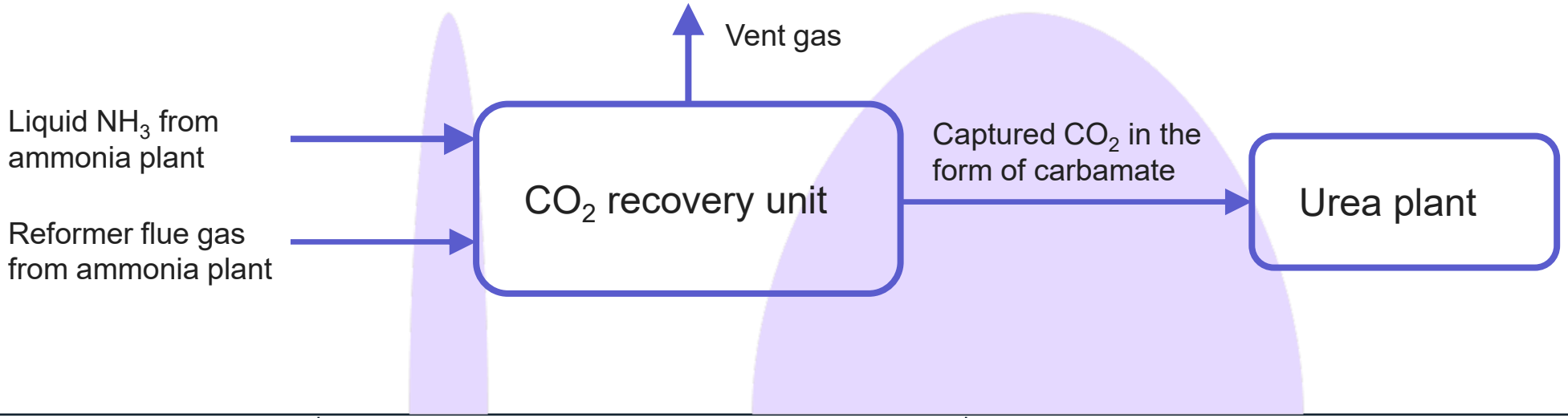
- Increase the capacity of urea plant by capturing CO_2 from an external source (e.g. flue gas from ammonia plant)
- Utilize surplus of NH_3 to capture CO_2
- CO_2 is captured in the form of carbamate (in the form of solution)
- Carbamate is used directly in urea melt plant



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TYPICAL FLUE GAS COMPOSITION

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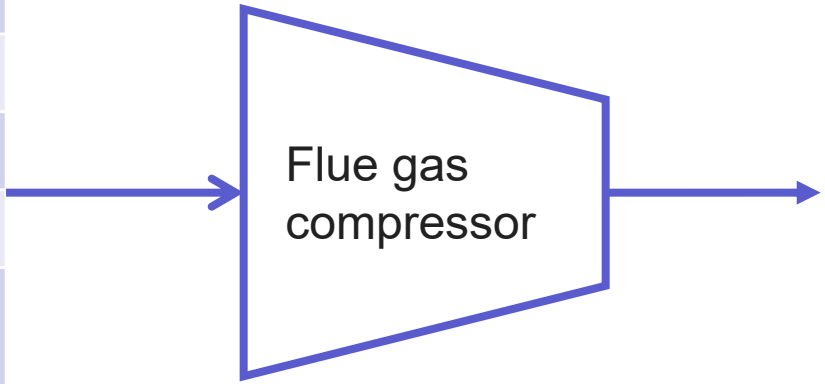
Component	Units	Value
CO_2	wt.-%	15.2
H_2O	wt.-%	0.8
O_2	wt.-%	4.0
N_2	wt.-%	80.0
NO_x and SO_x (*)	wt.-%	traces
P	bara	1.07
T (**)	°C	135-150



Flue gas is compressed to 28 - 30 bara to CO_2 recovery unit

(*) SO_X and NO_x removal if required then by commercially available technologies like wet scrubbers or catalytic converters. OSBL (outside battery limit) for Stamicarbon.

(**) First cool the flue gas to about 50°C from 135°C before it enters compressor. The compressor discharge temp is 140°C which will enter our CO_2 recovery column

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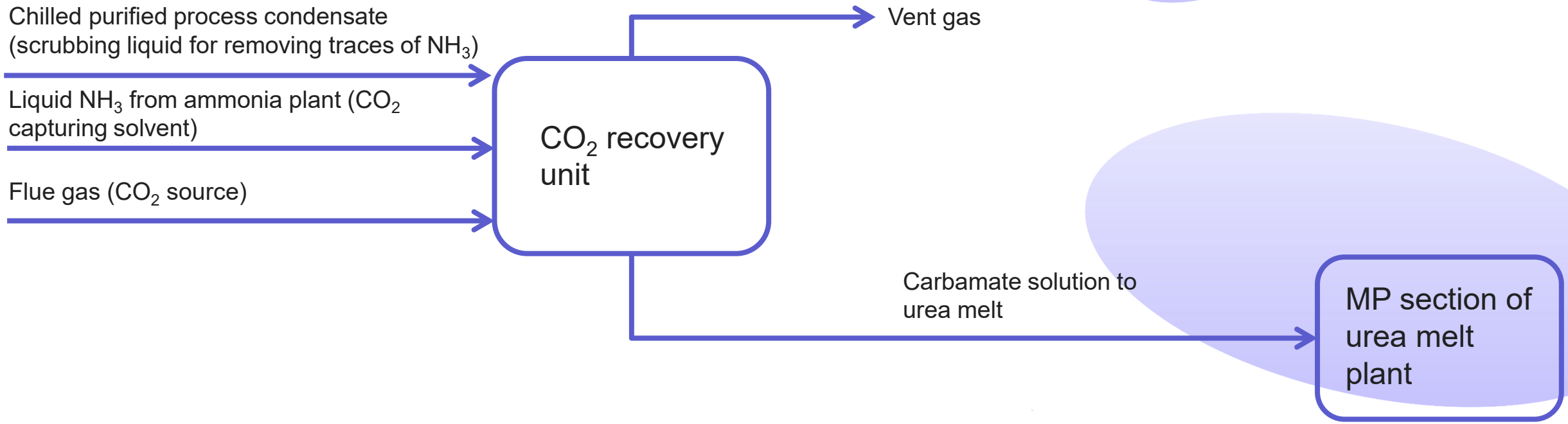
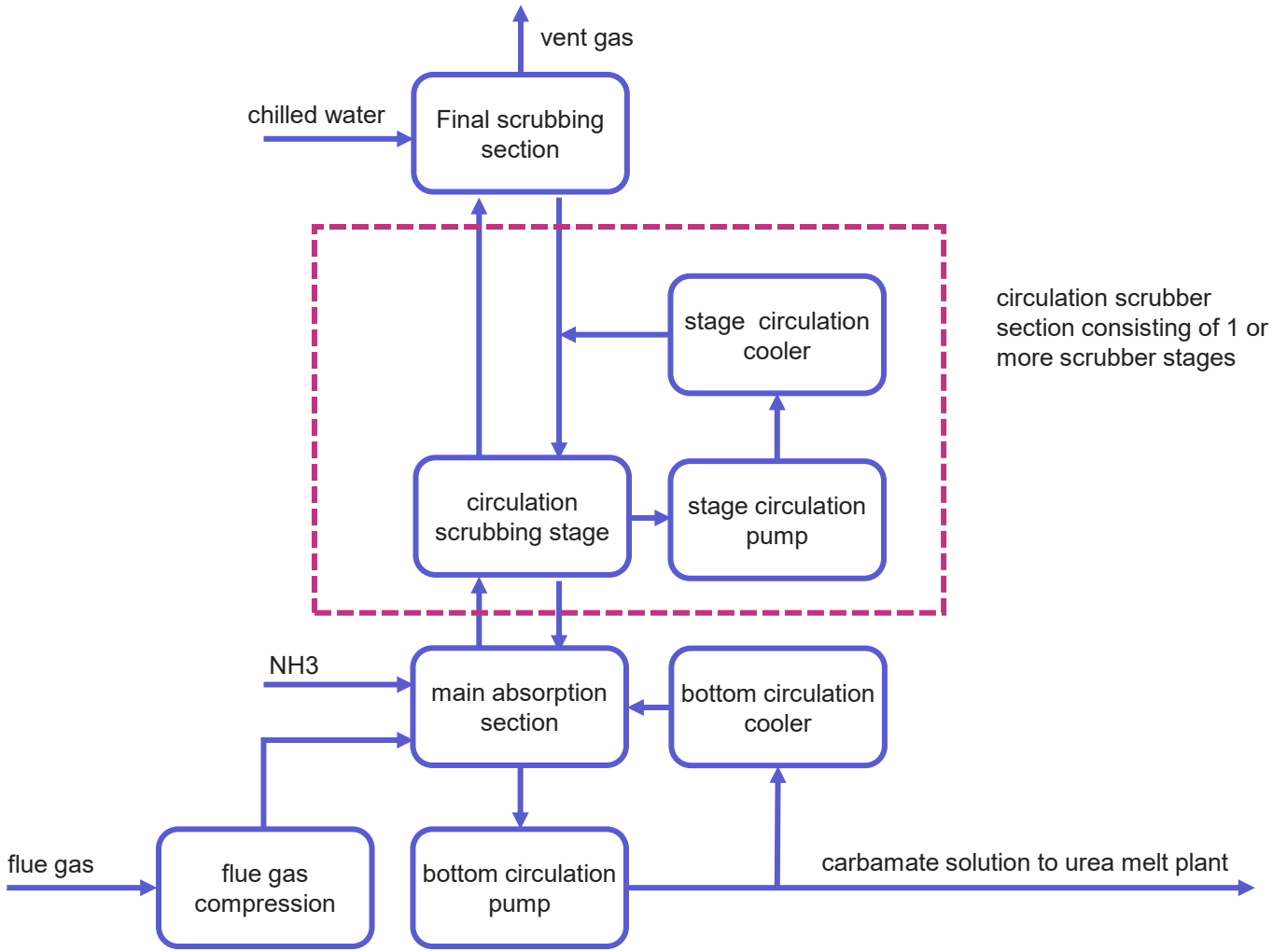
CO_2 RECOVERY CONCEPT

SIMPLIFIED REPRESENTATION OF CONCEPT



$$CO_2 \text{ capturing efficiency} = \frac{\text{Total mass flow of } CO_2 \text{ in flue gas feed} - \text{Mass flow of } CO_2 \text{ in vent gas}}{\text{Total mass flow of } CO_2 \text{ in flue gas feed}}$$

BLOCK DIAGRAM OF CO_2 RECOVERY UNIT



EFFECT OF COLUMN OPERATING PRESSURE ON CO_2 CAPTURING EFFICIENCY

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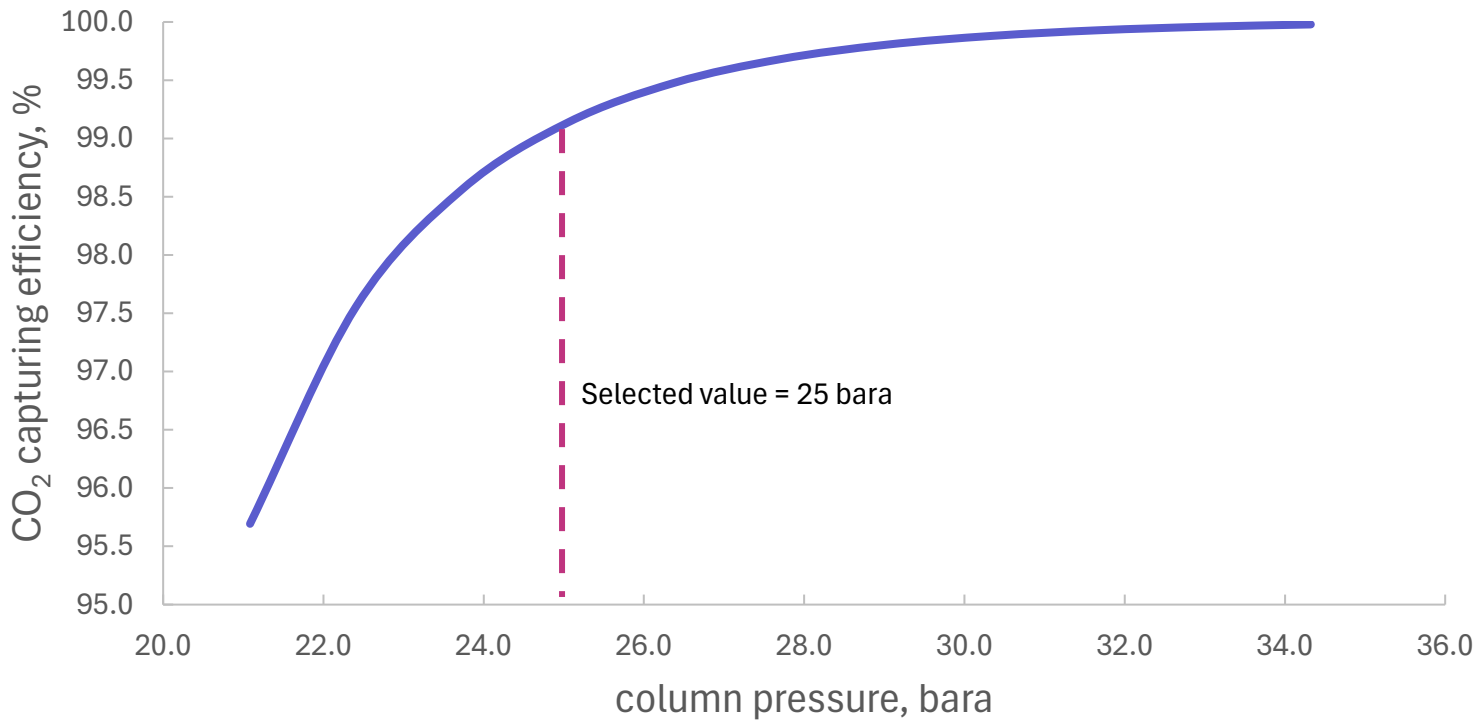

EFFECT OF CO_2 CONTENT IN FLUE GAS ON CO_2 CAPTURING EFFICIENCY AND NH_3 CONC. IN VENT GAS

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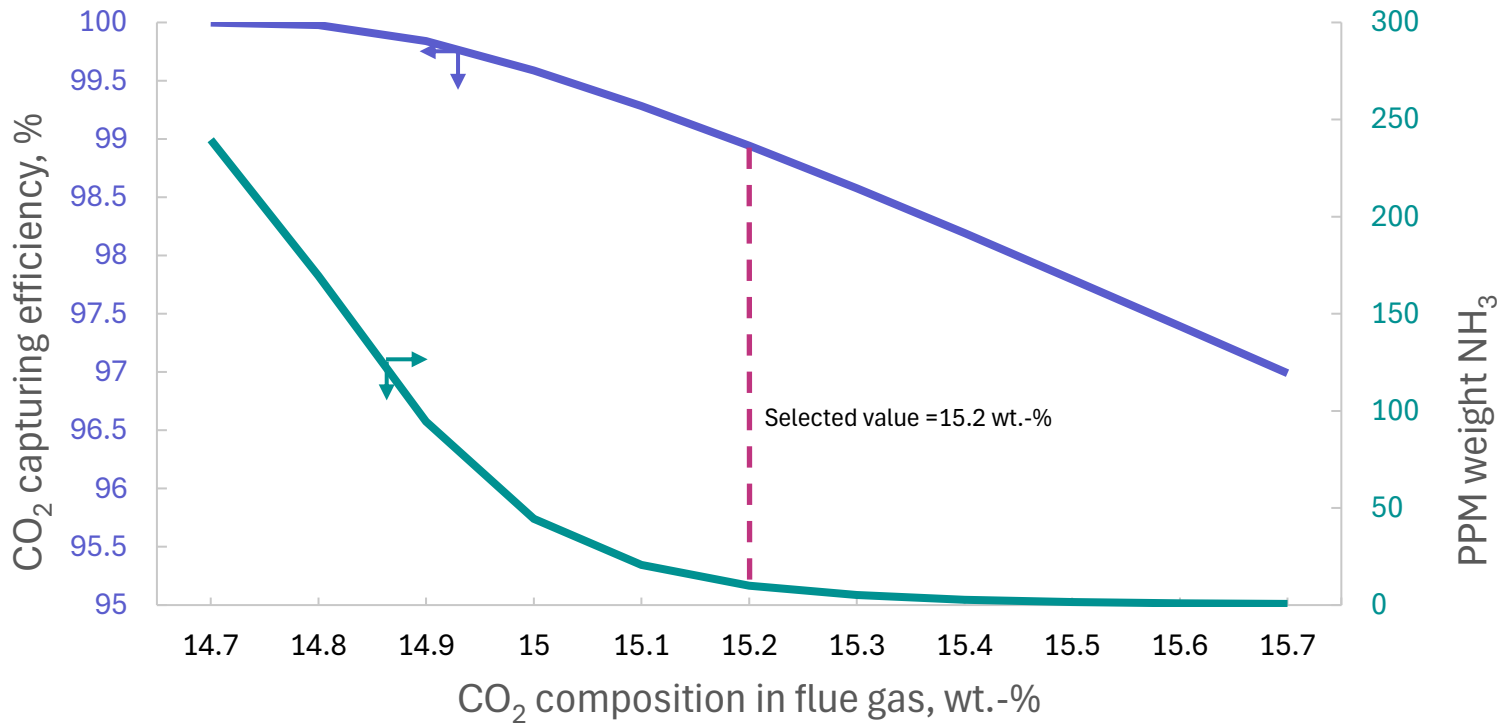

EFFECT OF CHILLED WATER TEMP. AT THE FINAL SCRUBBING SECTION

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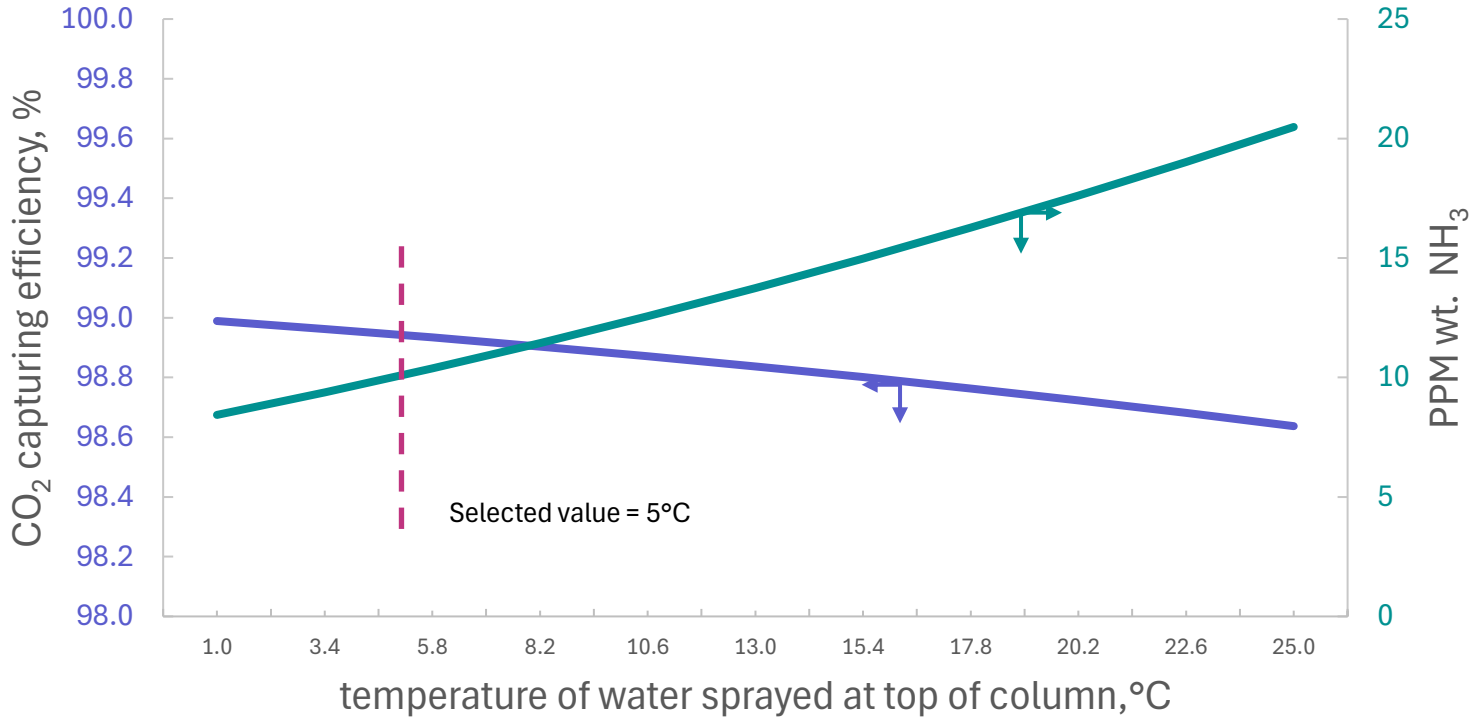

TEMPERATURE PROFILE IN A CO_2 CAPTURING COLUMN

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Stage	Water concentration, wt.-%	Temperature, °C	Crystallization temperature, °C
Bottom absorption	30	86	76
Circulating scrubbing	70	45	29

SUMMARY OF CONCEPT

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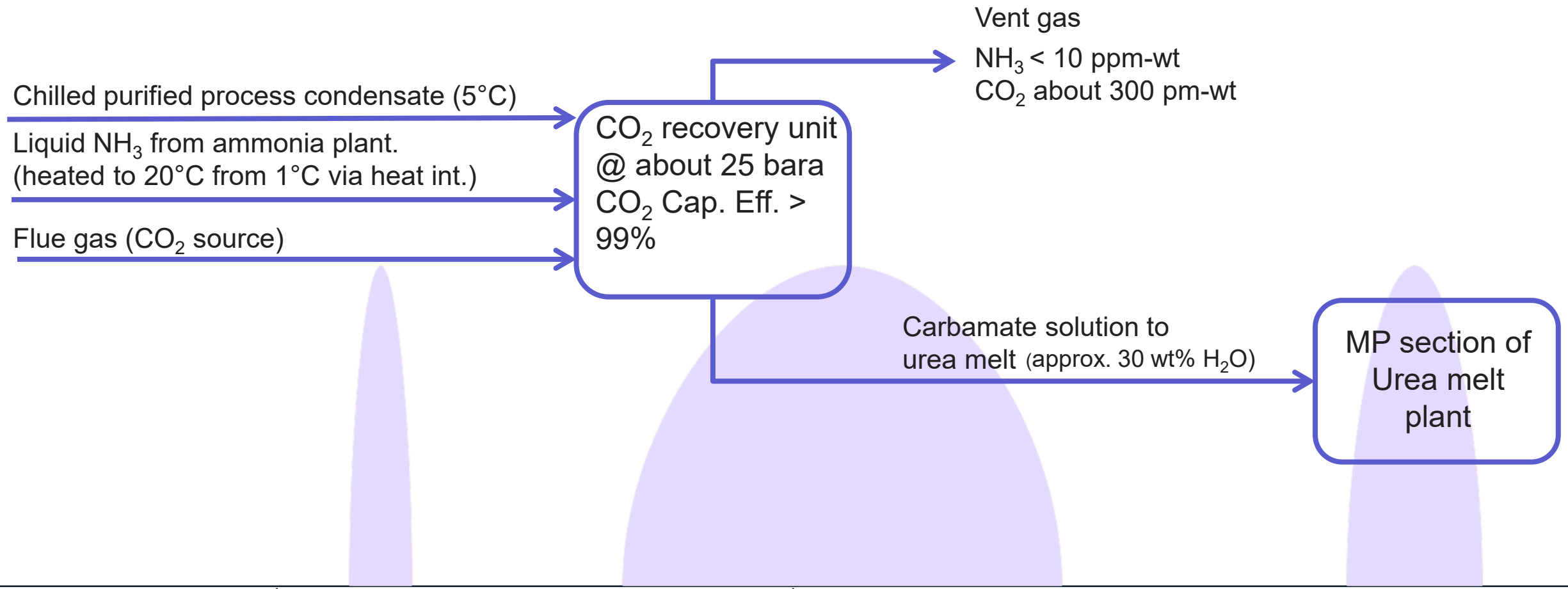

3D VIEW OF CO_2 RECOVERY UNIT

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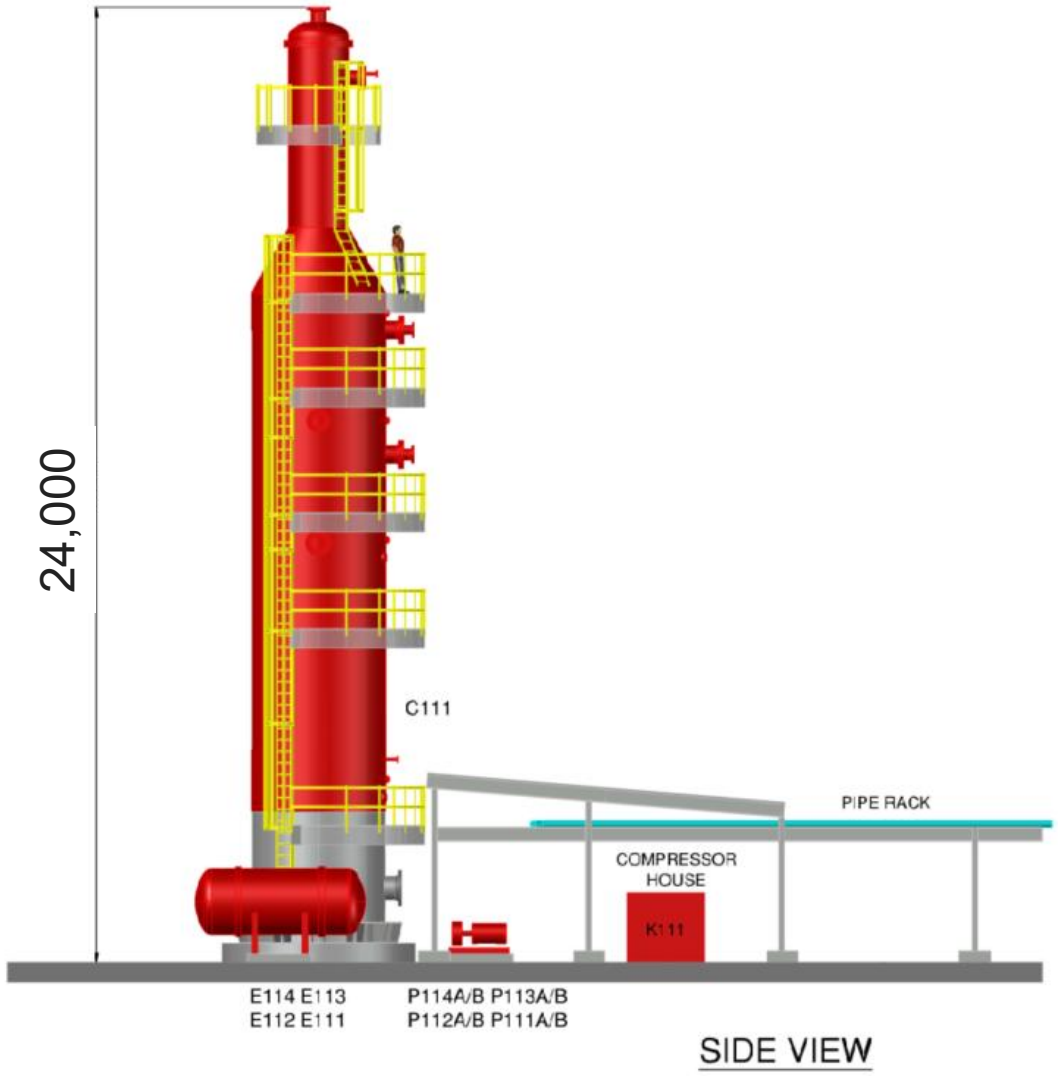
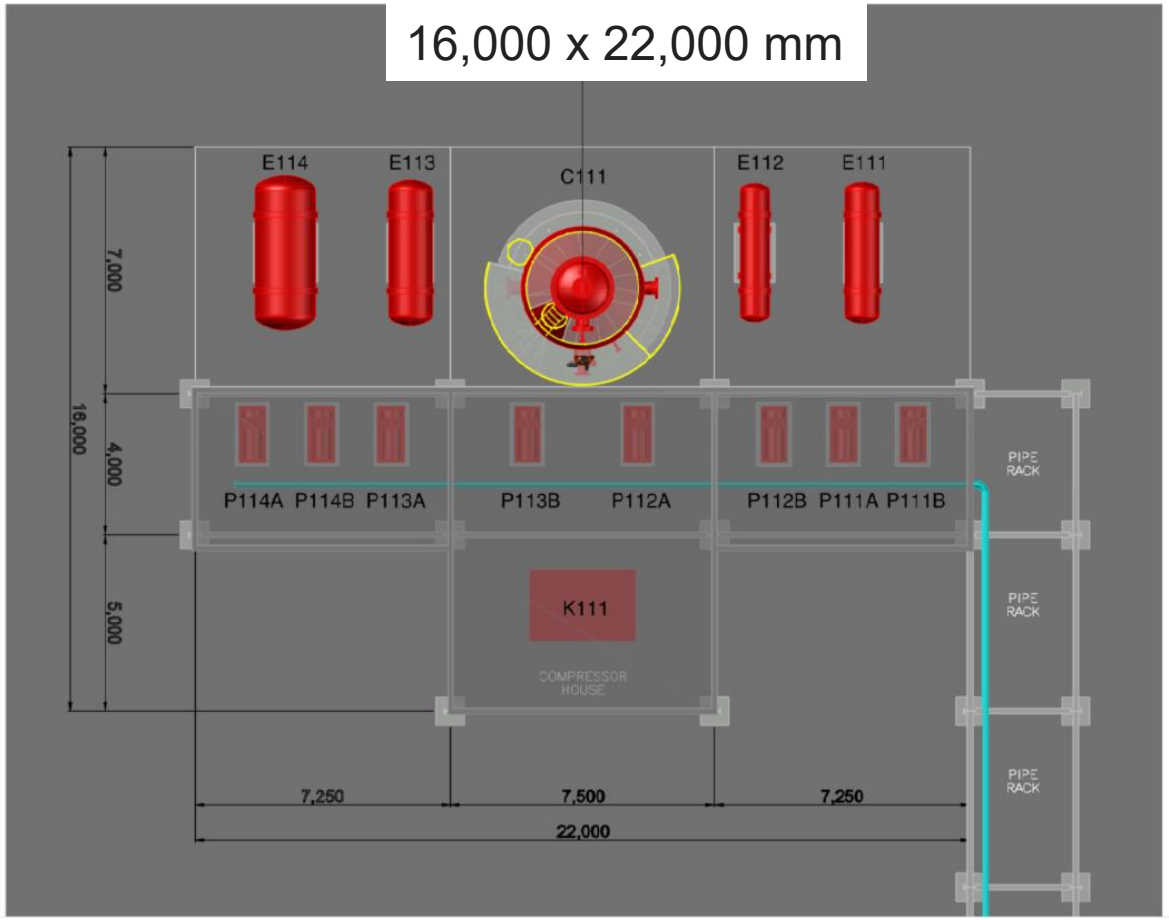


SIDE VIEW



INTEGRATION WITH UREA MELT PLANT

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Aim:

- Carbamate stream from CO_2 recovery unit

↓ is directly utilized for

- More urea production

↓ at about

- Same operational costs as current plant design

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INTEGRATION WITH UREA MELT PLANT

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MAIN HIGHLIGHTS:

- Integration can be done for any Stamicarbon CO_2 stripping plant; pool reactor, pool condenser or HPCC
- While admitting a new stream in the melt plant leads to increase of steam consumption

PROPOSED SOLUTION:

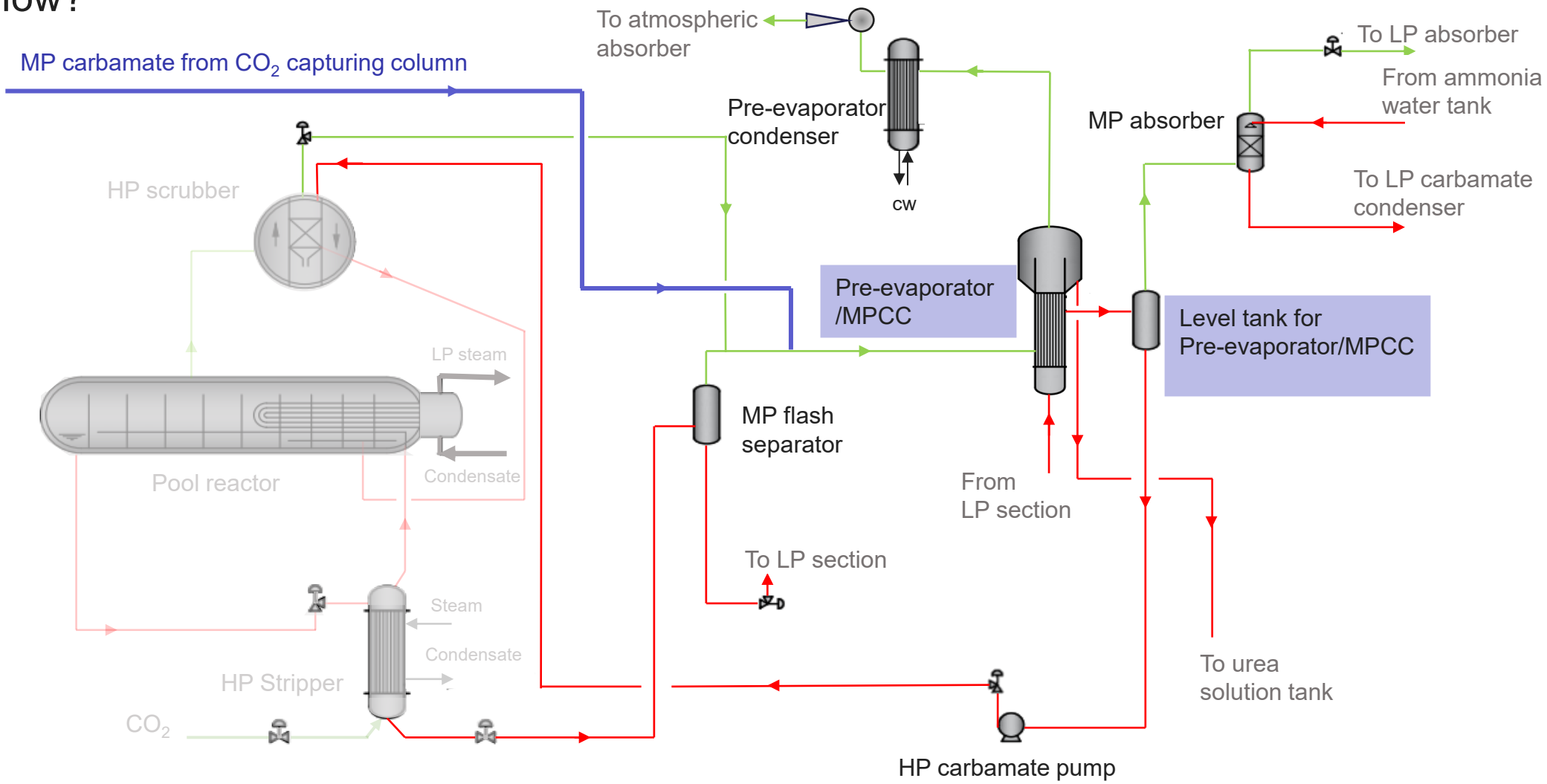
Revamp of the urea plant

Stamicarbon MP flash technology

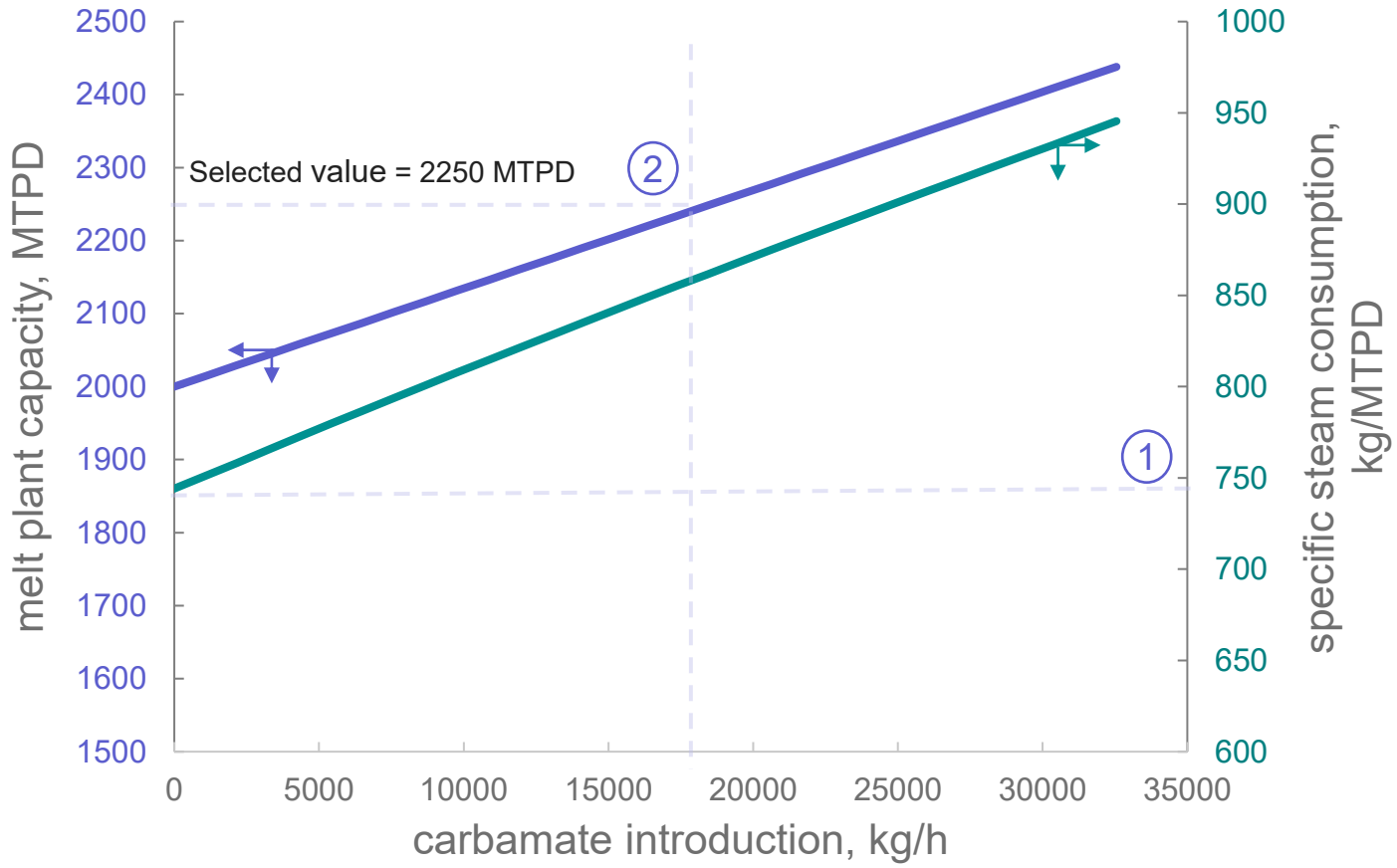
Adding MP flash technology can save about **150 kg/ton urea** of steam and utilize it to increase the plant capacity

INTEGRATION WITH UREA MELT PLANT

How?



EFFECT OF THE REVAMP IN THE UREA MELT PLANT



Before revamp:
- 2000 MTPD, prilling plant as finishing section
- about 891 kg steam /ton urea

(at 23.5 bara and 300 °C)

(1) Implementing MP flash technology:
- 2000 MTPD, prilling plant as finishing section
- about 150 kg steam /ton urea less, about 740 kg steam /ton urea

(2) Admitting additional CO_2:
- 2250 MTPD
- about same steam consumption as before

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CONCLUSION

CONCLUSIONS

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- Stamicarbon has developed an efficient solution for capturing CO_2 from flue gas.
- Utilizing the captured CO_2 directly in the urea plant enables a cost-effective production increase of up to 20%.
- A CO_2 capturing technology that contributes to the sustainability and reduces the CO_2 footprint of manufacturing urea.

Ready for implementation!

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THANK YOU

QUESTIONS?

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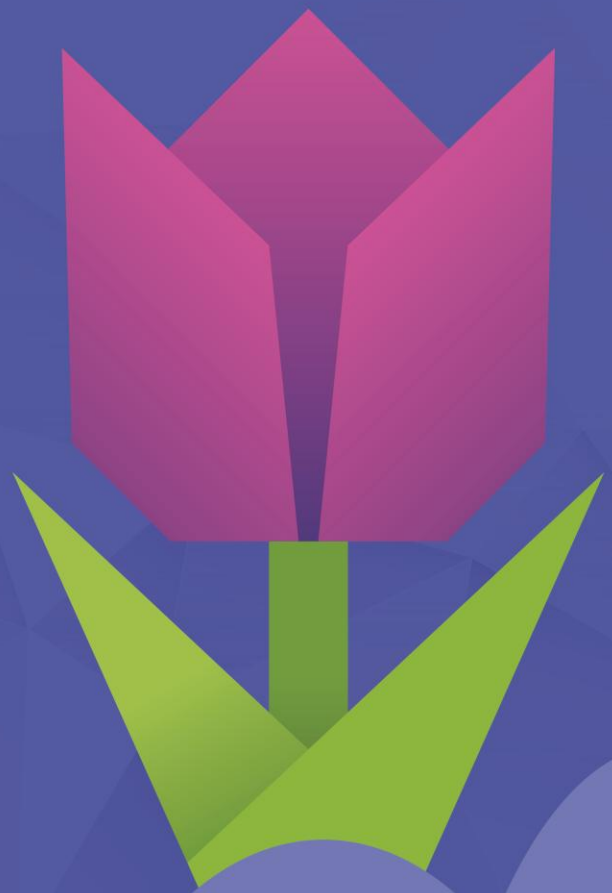

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THANK YOU

QUESTIONS?